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ABSTRACT

The results of a process of designing, building, and "de-bugging" two replacement language laboratory hardware systems at Concordia University (Montreal) are described. Because commercially available systems did not meet specifications within budgetary constraints, the systems were built by the university technical department. The systems replaced were a multiple source, dial-access type, audio-active laboratory system and a cassette type student recording laboratory. The new audio-active system consists of 24 rack-mounted computer type cassette decks and a Umatic videodeck. The 19 student booths have video monitors, with controls provided for students and teacher. External telephone access is provided to one pre-chosen cassette deck. The cassette type recording laboratory has been rearranged so that all cassette decks are located behind the teacher's desk; the wing-chair type student booths are located in 2 blocks with 11 booths per block. The student booths in the recording laboratory are equipped so that the students may record from the master track the student is following, or from a main source deck. Student controls were kept as simple and rugged as possible. Teacher controls avoided micro-computer terminals. Both systems were within the budget and have been working satisfactorily. (AMH)

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When 'Less is More': The Optimal Design of Language Laboratory Hardware

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Concordia University has a population of about twenty thousand students, a majority of whom are part-time adult students whose first language is not English. Moreover we are located in a French/English bilingual city; hence language teaching is a major preoccupation with us. The university operates five language laboratories on two campuses, and these serve courses in: English as a Second Language, French, Spanish, German, Italian, Hebrew and Russian.

In the past decade a number of commercial language laboratory systems have been employed more or less satisfactorily. These have ranged upward from simple "audio-active" group-paced systems to multi-cassette booth systems. We have also provided external telephone access to the tape-bank of one system, and we have experimented with take-home cassette units especially designed for language study. It became apparent in 1978 that one of the audio-active dial-access laboratories had reached the stage where replacement would cost less than continued maintenance. In 1979 one of the laboratories with audio-cassette units in each student position reached the same state, thus we were faced with replacing two systems in as many years.

The results of formal experiments conducted by G. A. B. Moore and by G. Boyd were combined and collated with informal surveys of teachers and students to determine the specifications for optimal replacement language laboratory hardware systems. Then these systems were built and "de-bugged". The present paper describes the results of this process.

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Commercially Available Systems

When we compared our specifications with what was commercially available we found that no commercial systems within our budget did what we needed done. Some of the more expensive systems, (such as the ELS SStar) did meet most of our requirements. Others were far more complicated in ways which appeared to us would degrade their performance under our operating conditions. Solid state control is very desirable for reliability, but microprocessors with volatile memories which forget how the lab is operating whenever there is a brief power interruption are not reliable. Another common fault is to ignore the fact that teachers like to stand and use the blackboard keeping an eye on the status of all booths and students at a glance. Some of the computer controlled systems lock the teacher into a chair at the console and require commands to be typed in to exhibit status on a small CRT (TV) screen.

We are fortunate in possessing a technical department with the capability of engineering and building audio and digital equipment. Consequently we built our own replacement systems, using standard components wherever possible.

Multiple Source (Dial-Access/Type) Audio-Active Laboratory

In 1978 it was necessary to replace our dial-access (banc-sonore) audio-active laboratory system. We designed and built a new pushbutton code selection audio cassette deck audio-active system as the replacement. This laboratory is used by students in a number of different courses on a drop-in or by-appointment basis. It also feeds our two telephone lines to enable students to call in from work on their lunch-hours, or call from home to use the practice materials.

The source machines consist of 24 rack mounted computer type (PhiDeck) cassette decks and a Umatic videodeck. The 19 desk type student booths have video monitors in them in order that students may use video materials. A five pushbutton (5 bit) code is pressed in by the student to choose the source he or she wishes to work from. The cassettes have a control tone recorded at the end of the lesson which causes the deck to stop and rewind back to the beginning, so that they will be immediately available for the next usage. Monitor and intercom facilities are provided for the language laboratory

supervisor, or for a teacher's use when whole classes are booked into this laboratory. Quite rugged, low impedance, student headsets with special plugs (Astrolite/UK) were found to be necessary to withstand student handling and to discourage theft. Two volume controls of the detent-less (to prevent twisting knobs off) kind, one for the master track, and one for the audio-active feedback are provided.

External telephone access is provided because so many of our students are part-time students living and working at appreciable distances from the campus. Each of the external telephone numbers provides access to only one pre-chosen cassette deck (the current French lessons) because too few of our students have touch-tone telephones to make a touch tone selection interface cost-effective.

This audio-active multiple source laboratory has been in almost continuous use now for three years and no serious difficulties have been encountered with any of the equipment. Maintenance has been pretty well confined to cleaning, head demagnetization and the occasional push button switch replacement.

Student Recording Language Laboratory

In 1979 it became necessary to replace the (Cybervox) cassette type student recording language laboratory, which after eight years of hard use was beginning to exhibit unduly high maintenance requirements.

For the convenience of the teacher and to insure security during examinations it was decided to locate all the cassette decks in one location behind the teacher's desk rather than having one deck in each booth as was the case previously. This new arrangement has the added advantage that it is possible to replace a defective deck with a spare without disturbing the pupils. A faulty deck does not mean a booth out of service.

The new laboratory uses wing-chair type booths which we have found give a better sound isolation and more comfort than the loose chair and desk arrangements. The booths are grouped in two blocks with 11 booths per block in a wide, shallow, two-row configuration to provide good eye contact with the teacher.

One teacher or monitor can supervise a large class from the central podium quite conveniently, or two smaller independent classes can be supervised by one or two teachers. Alternatively, when no class is scheduled, students can use booths on an individual basis with or without a monitor in attendance.

Handicapped Students' Position

Students in wheelchairs have access to two special positions at the end of the rows of chair-booths where they can wheel in and park and use a control wand and headset just as though they were sitting in an adjacent booth.

Control/Capabilities Offered

The system engineered by Mr. Kershaw enables a language teacher or a laboratory monitor to work with one or two groups of students either on a group or on an individualized basis. Each student can record onto his particular audio-cassette. This may already contain the master track he is following, or the master track may be provided directly from one of the main cassette or reel source-decks. Each student has forward, stop, record, play and rewind controls.

The teacher has controls for playing a main source directly to the students and for recording it on their cassettes, and also controls for monitoring and talking to individual students or groups of students. A block diagram of the audio feed and feedback links is given in Figure 1. If the entire 22 positions are being used by one class the "commoning switches" are closed and teacher A can listen to any student and talk to any or all of them by means of the selector switches.

The cassette deck motion-control system is shown in the block diagram of Figure 2. Again the commoning switches are closed if all booths are occupied by one class or study group. The status lines turn on indicator lights on the panel to exhibit deck status to the teacher. Even when standing and talking to the class the teacher can "read" this panel.

One special feature which did seem worthwhile was to arrange the system so that when tests or examinations are being given the examination questions are *not* recorded on the students' tapes. Only the student responses are recorded thus making marking easier. This

Figure 1: AUDIO SYSTEM

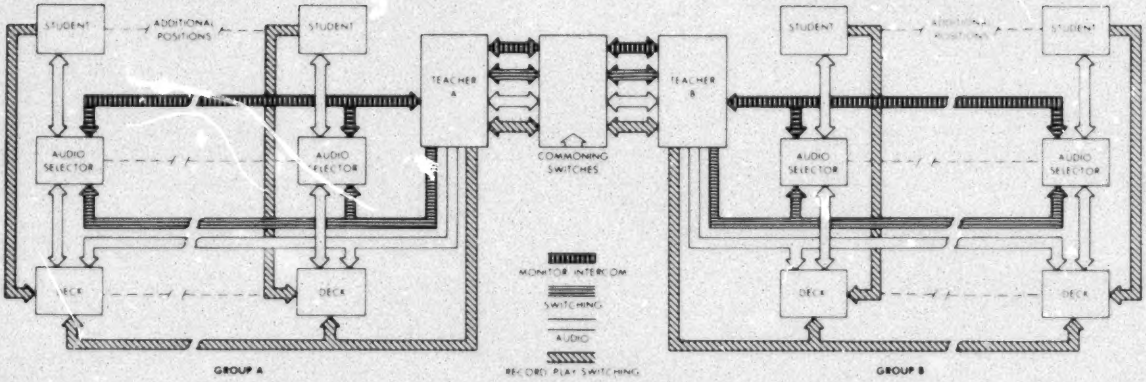
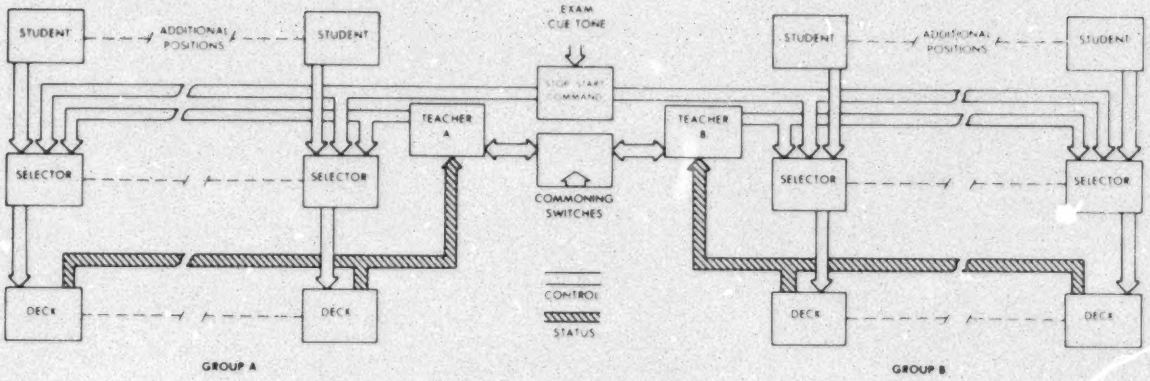


Figure 2: DECK MOTION CONTROL SYSTEM



is done by recording cue tones on the master examination tape which put all the student machines into forward and record only when answers are expected.

The student controls are as simple as possible and are color coded. There are rewind (yellow), stop (blue), forward (green) and fast forward (white) motion push buttons. There is a record/playback switch for the student tracks and a record warning light. There is also a teacher call button and separate volume controls for the master track and the student tracks. There is a special rugged odd-sized ring tip and shell phone jack for the head set. Audio switching is actually accomplished using cards carrying analog crossbar switch chips. Each card handles eleven student positions. Four cards are required to carry the circuitry for controlling tape motion and providing status display.

Cost

In 1980 the components and wiring for the 22-position cassette recording laboratory cost about twelve thousand dollars. Three technicians worked four months part time building and installing the system (so that probably the labour costs were also in the vicinity of ten to twelve thousand dollars).

Features & Capabilities Deliberately Not Offered/Included

1) The student has no direct access to his or her cassette. The cassette drives are in a glazed cabinet behind the teacher. This facilitates security during examinations and makes it easy to substitute a tape drive if one fails. Moreover the student has no footage counter. This means that he/she must *listen* to the tape carefully to find the exercise being worked on after each replay. Consequently additional practice in careful listening is provided.

2) The teacher does not have a microcomputer terminal keyboard, screen, and command syntax to contend with. A very simple and straight-forward layout of switches and function lights allows the teacher to do what he/she wants to do *directly* and to observe the status of the whole system at a glance at any time. The micro-computer based systems tend to provide only a limited windowed view of the operation, and most require more or less complicated sequences of

commands to be typed in to do anything at all. Moreover many microcomputer systems "forget" how they are set up if there is a momentary power failure and the whole set-up procedure has to be typed in again before class can continue.

The new cassette recording laboratory has been working quite satisfactorily now for a year and no further modifications are contemplated.

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Gary Kershaw, a British-trained electronic engineering specialist, is currently engaged in research and development work in the Technical Division of the Audio-Visual Department, Concordia University. He designed, constructed, and installed the language laboratory described herein. He is presently engaged in further refinements featuring applications of linear and analog systems.

Gary Boyd is professor of education (educational technology) and assistant director (research and development) of the Audio Visual Department, Concordia University. He has B.Sc., M.Sc., and Ph.D. degrees in Physics and has been a specialist, since 1969, in computer-assisted-instruction, and experimental design in audiovisual work. He has been director of multiple language teaching experiments and has an extensive publications record in C.A.L., C.A.I., and related fields, notably: "REmedial and SEcond Language English Teaching using Computer-Assisted Learning" (in collaboration), *Computers and Education,* (1982, in press).